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The TRIDEC Virtual Tsunami Atlas - customized value-added simulation data products for Tsunami Early Warning generated on compute clusters

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The development of new Tsunami Early Warning Systems (TEWS) requires the modelling of spatio-temporal spreading of tsunami waves both recorded from past events and hypothetical future cases. The model results are maintained in digital repositories for use in TEWS command and control units for situation assessment once a real tsunami occurs. Thus the simulation results must be absolutely trustworthy, in a sense that the quality of these datasets is assured. This is a prerequisite as solid decision making during a crisis event and the dissemination of dependable warning messages to communities under risk will be based on them. This requires data format validity, but even more the integrity and information value of the content, being a derived value-added product derived from raw tsunami model output.

Quality checking of simulation result products can be done in multiple ways, yet the visual verification of both temporal and spatial spreading characteristics for each simulation remains important. The eye of the human observer still remains an unmatched tool for the detection of irregularities. This requires the availability of convenient, human-accessible mappings of each simulation.

The improvement of tsunami models necessitates the changes in many variables, including simulation end-parameters. Whenever new improved iterations of the general models or underlying spatial data are evaluated, hundreds to thousands of tsunami model results must be generated for each model iteration, each one having distinct initial parameter settings.

The use of a Compute Cluster Environment (CCE) of sufficient size allows the automated generation of all tsunami-results within model iterations in little time. This is a significant improvement to linear processing on dedicated desktop machines or servers. This allows for accelerated/improved visual quality checking iterations, which in turn can provide a positive feedback into the overall model improvement iteratively.

An approach to set-up and utilize the CCE has been implemented by the project Collaborative, Complex, and Critical Decision Processes in Evolving Crises (TRIDEC) funded under the European Union's FP7. TRIDEC focuses on real-time intelligent information management in Earth management. The addressed challenges include the design and implementation of a robust and scalable service infrastructure supporting the integration and utilisation of existing resources with accelerated generation of large volumes of data. These include sensor systems, geo-information repositories, simulations and data fusion tools. Additionally, TRIDEC adopts enhancements of Service Oriented Architecture (SOA) principles in terms of Event Driven Architecture (EDA) design.

As a next step the implemented CCE's services to generate derived and customized simulation products are foreseen to be provided via an EDA service for on-demand processing for specific threat-parameters and to accommodate for model improvements.